

QUADRATIC FUNCTIONS

FINAL EXAM REVIEW

KEY

1. The shape a quadratic function makes is a parabola. The maximum or minimum point of a quadratic function is called the vertex V_{min} V_{max}

2. What does a solution/root/zero look like on a graph? x-intercept

3. The formula to find the axis of symmetry is $x = \frac{-b}{2a}$

4. The quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. It finds the solutions

5. Tell whether the discriminant, $b^2 - 4ac$, must be greater than, less than, or equal to 0 to make each of the conditions true:

A. 2 x-intercepts $b^2 - 4ac > 0$

B. 1 x-intercept $b^2 - 4ac = 0$

C. no x-intercepts $b^2 - 4ac < 0$

1 perfect! 2 so-so 3 definitely need to re-learn this for the test!

6. Make a table of values for $y = (3x - 1)^2$

x	f(x)
-2	49
-1	16
0	1
1	4
2	25

7. The height, d, of an object after t seconds is modeled by the equation $d = -16t^2 + 3500$. Find the height of the object after 3 seconds. $-16(3)^2 + 3500 = -144 + 3500 = 3356$ ft

8. Find the vertex of $y = -3x^2 + 12x - 8$
on calc 2nd trace + max $x = \frac{-b}{2a} = \frac{-12}{2(-3)} = \frac{-12}{-6} = 2$ $f(2) = -3(2)^2 + 12(2) - 8 = -12 + 24 - 8 = 4$ (2, 4)

9. Find the vertex of $y = \frac{2}{3}(x - 2)^2 - 4$
(h, k) (2, -4)

10. List the value of a and c, and describe how each of these values transforms the graph.

$y = -5x^2 + 8$ $a = -5 \rightarrow$ reflected and skinny

$c = 8 \rightarrow$ shift graph up 8

11. Write the equation of the quadratic function with a vertex of (3, 5) through the point (2, 9).

$y = a(x - h)^2 + k$
 $9 = a(2 - 3)^2 + 5$ $9 = 1a + 5$ $a = 4$

$$y = 4(x - 3)^2 + 5$$

12. Expand $(2x + 3)(x - 1) = 2x^2 - 2x + 3x - 3 = 2x^2 + x - 3$

13. Factor $x^2 + 3x - 10$

$$(x + 5)(x - 2)$$

14. Find the solutions of $2x^2 + 9x = 18$ using the method of your choice.

$$-18$$

$$2x^2 + 9x - 18 = 0$$

$$x = -6, 1.5$$

Graph, Factor + zPP, or Quadratic Formula

$$\frac{-10 \pm 3}{5 \pm 2}$$

15. $i = ? \sqrt{-1}$ $i^2 = ? -1$

16. Simplify $\sqrt{-64} = 8i$

17. $(-2-i)(4+i) = -8 - 2i - 4i - i^2 = -8 - 6i - (-1) = -8 - 6i + 1 = \underline{-7 - 6i}$

18. Solve $x^2 + 4 = 0$ $\sqrt{x^2} = \sqrt{-4}$ $x = \pm 2i$

1 2 3 4 5

Overall rating for quadratic functions 1 2 3 4 5

EXPONENTIAL FUNCTIONS

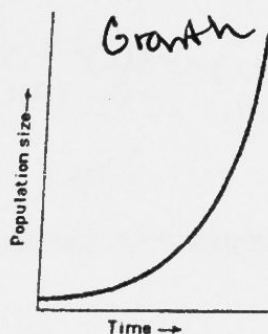
1. An exponential function takes the form $f(x) = a \cdot b^x$, where a represents initial amount and b represents growth or decay factor

2. If $b > 1$, the function is classified as growth and if $0 < b < 1$, the function is classified as decay.

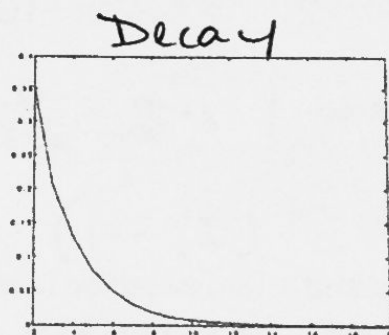
1 2 3 4 5

Are the following exponential growth or decay?

3.



4.



5.

x	y
-1	27
0	9
1	3

Decay

6. $y = -\frac{1}{3}(4)^x$

Growth

7. $y = 60(.4)^x$

Decay

1 2 3 4 5

1. ... the exponential function that models each situation.

8. A scientist starts with 150 bacteria that double in population every three days. Write an equation $b(d)$ to model the number of bacteria, b , after d days. $b(d) = 150(2)^{d/3}$
9. I have \$2500 in a mutual fund that earns 7% every three months. $y = 2500(1.07)^{n/3}$
10. After the zombie antidote comes out, the 10,000 zombies begin to die out at a rate of 12% each day. $100\% - 12\% = 88\% \Rightarrow 0.88$
 $y = 10,000(0.88)^x$
11. I have 80 gummy bears and every time I go to the cupboard I eat half of the gummies.
 $y = 80(\frac{1}{2})^x$

1 2 3 4 5

Find x . $3x - 5 = 4$

12. $8^{3x-5} = 8^4$
 $3x - 5 = 4$
 $3x = 9$
 $x = 3$

1 2 3 4 5

13. $2^{6x-2} = 1 = 2^0$
 $6x - 2 = 0$
 $6x = 2$
 $x = 2/6 = .3$

$6x - 2 = 0$

$6x = 2$
 $x = 2/6 = .3$

$x = 2/6 = .3$

14. $5^{-2x+1} = 125 = 5^3$
 $-2x + 1 = 3$
 $-2x = 2$
 $x = -1$

$-2x + 1 = 3$

$-2x = 2$
 $x = -1$

$x = -1$

15. Make a table for $f(x) = 4^{-x} + 1$

x	-2	-1	0
$f(x)$	17	5	2

Overall rating for exponential functions 1 2 3 4 5

TRIGONOMETRY

1. I can only use the Pythagorean Theorem and trig functions if I have a right triangle.
2. A good first step to any problem that uses a trig function is to label the sides.
3. The nine letter device that is used to help me remember the definitions of sine, cosine, and tangent is SA - CA - TA.
4. The longest leg of a triangle is called the hypotenuse.
5. An angle can either be measured in radians or degrees.
6. The height of a wave is called the amplitude and how long it takes before the wave repeats is called the period.

1 2 3 4 5

7. Convert $\frac{3\pi}{7}$ radians to degrees.

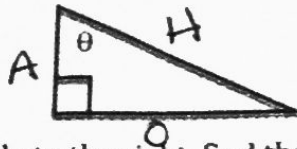
$\frac{3\pi \text{ rad}}{7} \times \frac{180^\circ}{\pi \text{ rad}} = \frac{3 \cdot 180}{7} \approx 77.1^\circ$

8. Convert 80° to radians

$\frac{80^\circ}{1} \times \frac{\pi \text{ rad}}{180^\circ} = \frac{80\pi}{180} = \frac{4\pi}{9}$

1 2 3 4 5

9. For the right triangle and angle indicated, label which side is the hypotenuse, opposite and adjacent.

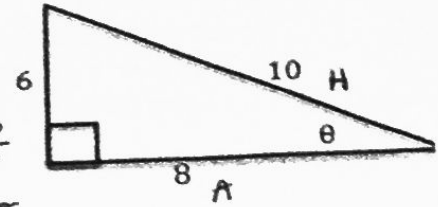


10. For the triangle to the right, find the value of the six trig functions.

1 2 3 4 5

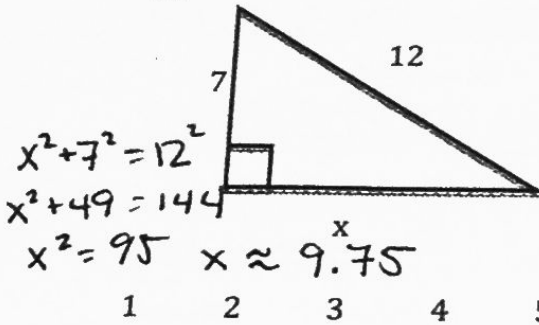
$$\sin \theta = \frac{6}{10} \quad \cos \theta = \frac{8}{10} \quad \tan \theta = \frac{6}{8}$$

$$\csc \theta = \frac{10}{6} \quad \sec \theta = \frac{10}{8} \quad \cot \theta = \frac{8}{6}$$



Find the missing angle or side length.

11.



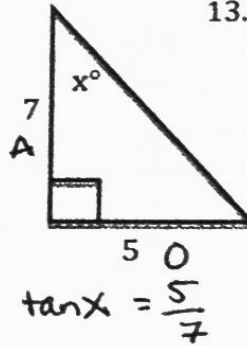
$$x^2 + 7^2 = 12^2$$

$$x^2 + 49 = 144$$

$$x^2 = 95 \quad x \approx 9.75$$

1 2 3 4 5

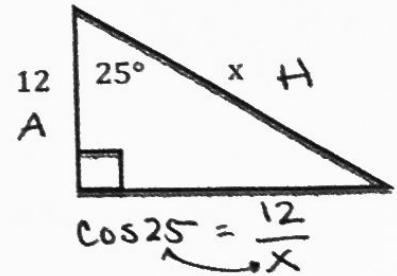
12.



$$\tan x = \frac{5}{7}$$

$$x = \tan^{-1}\left(\frac{5}{7}\right) \approx 36^\circ$$

13.

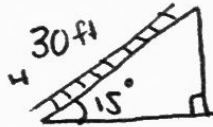


$$\cos 25^\circ = \frac{12}{x}$$

$$x = \frac{12}{\cos 25^\circ} \approx 13.2$$

14. A 30 ft ladder sits against a wall with an angle of elevation of 15 degrees. How high up on the wall is the ladder?

1 2 3 4 5



$$\sin 15^\circ = \frac{x}{30}$$

$$x = 30 \sin 15^\circ \approx 7.8 \text{ ft}$$

15. Find the period of $y = 4 \cos 2x$

$$\frac{360}{2} = 180^\circ$$

16. Find the amplitude of $y = -6 \sin 3x$

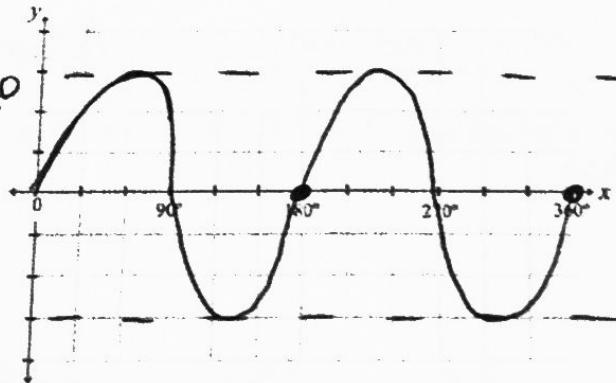
$$|a| = 6$$

17. Write an equation for the graph

18. Graph $y = 3 \sin 2x$

$$a=3$$

$$\text{Period} = \frac{360}{2} = 180^\circ$$



1 2 3 4 5

Overall rating for trigonometry

1 2 3 4 5